NeetPreparation

Physical World and Managemant Important Questions With Answers

NEET Physics 2023

1. If x = at + bt^2, where x is in metres and t is in hours, the unit of b will be:
   a) metre b) metre/hour **c) metre/$(hour)^2$** d) $metre^2$/hour

   Solution : -
   x = at + bt^2
   Units of quantities x and bt^2 must be same.
   $$\therefore\ Unit\ of\ b=\frac{unit\ of\ x}{unit\ of\ t^2}=\frac{metre}{(hour)^2}.$$

2. In Physics, unification means:
   a) properties of a system and interactions of its constituents of simpler parts
   b) manifestation of universal laws c) physical phenomena in terms of a few concepts and laws
   d) both (b) and (c)

   Solution : -
   In physics, we try to understand diverse physical phenomena in terms of a few concepts and laws. Our attempt is always to see the physical world as the manifestation of some universal laws in different areas and under different conditions. For example, the basic laws of electromagnetism (Maxwell's equations) govern all electric and magnetic phenomena.

3. The dimensional formula for permeability of free space μ_o is ___________
   a) $\left[\mathrm{MLT}^{-2}\ \mathrm{A}^{-2}\right]$ b) $\left[\mathrm{ML}^{-1}\ \mathrm{T}^{2}\ \mathrm{A}^{-2}\right]$ c) $\left[\mathrm{ML}^{-1}\ \mathrm{T}^{2}\ \mathrm{A}^{2}\right]$ d) $\left[\mathrm{MLT}^{-2}\ \mathrm{A}^{-1}\right]$

   Solution : -
   From Biot-savart law
   $$dB=\frac{\mu_0}{4\pi}\frac{Idl\sin\theta}{r^2}$$
   $$Idl=\text{ current element}$$
   $$r=\text{ displacement vector}$$
   $$\mathrm{m}_0=\frac{4\pi r^2(d\,\mathrm{B})}{Idl\sin\theta}=\frac{(\mathrm{L}^2)\left[\mathrm{MT}^{-2}\ \mathrm{A}^{-1}\right]}{[\mathrm{A}][\mathrm{L}]}=\left[\mathrm{MLT}^{-2}\ \mathrm{A}^{-2}\right]$$

4. The dimensional formula for Boltzmann's constant is:
   a) $\left[ML^2T^{-2}\theta^{-1}\right]$ b) $\left[ML^2T^{-2}\right]$ c) $\left[ML^0T^{--2}\theta^{-1}\right]$ d) $\left[ML^{-2}T^{--1}\theta^{-1}\right]$

5. Magnetic field is measured by:
   a) weber b) henry c) weber-$(metre)^2$ **d) weber/$(metre)^2$**

6. The Richardson equation is given by $I=AT^2e^{-B/kt}$ The dimensional formula for AB^2 is same as that
   a) IT^2 b) kT **c) Ik^2** d) Ik^2/T

   Solution : -
   $I=AT^2e^{-B/kt}$
   Dimensionally, A = I/T^2, dimensions of B = kT
   (∵ power of exponential is a number)
   $$AB^2=\frac{I}{T^2}(kT)^2=Ik^2$$

7. The correct order in which the dimensions of length increases in the following quantities is:
   (i) permittivity
   (ii) resistance

(iii) magnetic permeability
(iv) stress
a) (i), (ii), (iii), (iv)   b) (iv), (iii), (ii), (i)   **c) (i), (iv), (iii), (ii)**   d) (iii), (ii), (iv), (i)

8. Given that: $F = -\eta A \frac{dv}{dx}$, where F is force, A is area and $\frac{dv}{dx}$ is velocity gradient,then dimensional formula of η should be:
a) $[ML^{-1}T^{-1}]$ b) $[ML^{-1}T]$ c) $[ML^{-2}T^{-2}]$ d) $[ML^{2}T^{-1}]$

Solution : -

$$[\eta] = \left[\frac{F/A}{dv/dx}\right] = \frac{[MLT^{-2}/L^2]}{[LT^{-1}/L]} = [ML^{-1}T^{-1}].$$

9. Two forces of 5 Nand 12 N simultaneously act on a particle. The net force on the particle is:
a) 17 N   b) 12 N   c) 13 N   d) 7 N   e) between 7 Nand 17 N

10. SI unit of magnetic flux is:
a) tesla   b) oersted   **c) weber**   d) gauss

11. Joule-second is the unit of:
a) Work   b) Momentum   c) Pressure   **d) Angular momentum**

Solution : -

In this :
$\tau = \frac{dL}{dt}$
$= \tau \times dt = r \times F \times dt$
With this, unit of angular momentum is joule second.

12. Lightyear is used to measure:
a) distance between stars   b) distance between atoms   c) revolution time of the earth around the sun
d) none of the above

13. SONAR emits which of the following waves?
a) Radio waves   b) Micro waves   **c) Ultrasound waves**   d) Gamma rays

14. 1 unified atomic mass unit (1 u) is equal to :
a) 1.66×10^{-25} kg   **b) 1.66×10^{-27} kg**   c) 1.66×10^{-29} kg   d) 1.66×10^{-31} kg

Solution : -

1 u = 1.66×10^{-27} kg

15. If the value of force is 100 N and value of acceleration is 0.001 ms^{-2} s, what is the value of mass in this system of units?
a) 10^3 kg   b) 10^4 kg   **c) 10^5 kg**   d) 10^6 kg

Solution : -

Here, F = 100 N, a = 0.001 m S^{-2}
∵ F = ma
$\therefore m = \frac{F}{a} = \frac{100N}{0.001ms^{-2}} 10^5 kg$

16. How many wavelengths of Kr^{86} are there in one metre?
a) 1553164.I3   **b) 1650763.73**   c) 2348123.73   d) 652189.63

Solution : -

The number of wavelengths of Kr^{86} in 1 m is 1650763.73.

17. Which of the two have same dimensions?
a) Force and strain   b) Force and stress   **c) Angular velocity and frequency**   d) Energy and strain

18. What is full form of GMRT?
a) Ground Mobile Receive Terminal   b) Geometric Mean Reciprocal Titer
c) Giant Metrewave Radio Telescope   d) General Maintenance and Repair Technician

Solution : -

Giant Metrewave Radio telescope (GMRT).

19. The displacement of a progressive wave is represented by y = A sin(ωt - kx) where x is distance and t is where x is distance and t is time. The dimensions of $\frac{\omega}{k}$ are same as those of :

a) velocity b) wave number c) wavelength d) frequency

Solution : -

y = A sin (ωt - kx)

As (ωt - kx) represents an angle which is dimensionless, therefore

$[\omega]=\frac{1}{[t]}=\left[T^{-1}\right]$ and $[k]=\frac{1}{[x]}=\left[L^{-1}\right]$

$\left[\frac{\omega}{k}\right]=\frac{\left[T^{-1}\right]}{\left[L^{-1}\right]}=\left[LT^{-1}\right]=velocity$

20. If 49 divisions on the vernier scale coincide with 50 divisions on the main scale of a vernier- calliper, then what would be the least count of the instrument, if graduation on the main scale is 2 mm?

a) $\frac{1}{25}mm$ b) $\frac{1}{50}mm$ **c)** $\frac{2}{49}mm$ d) $\frac{1}{49}mm$

Solution : -

Least count of vernier scale= $\left[\left(1+\frac{1}{n}\right)-1\right]\times$ Least count of main scale

$=\frac{1}{49}\times 2 \quad mm=\frac{2}{49}mm$

21. The dimensional formula for angular momentum is ______

a) $\left[\mathrm{M}^0\ \mathrm{L}^2\ \mathrm{T}^{-2}\right]$ **b)** $\left[\mathrm{ML}^2\ \mathrm{T}^{-1}\right]$ c) $\left[\mathrm{MLT}^{-1}\right]$ d) $\left[\mathrm{ML}^2\ \mathrm{T}^{-2}\right]$

Solution : -

Angular momentum

L= r × p = r × mv

Dimensional formula for angular momentum : [L] [M][LT^{-1}] = [ML^2T^{-1}]

22. The dimension of the ratio of angular to linear momentum is:

a) [M^0LT^0] b) [MLT^{-1}] c) [ML^2T^{-1}] d) [$M^{-1}L^{-1}T^{-1}$]

Solution : -

$\left[\frac{J}{P}\right]=\left[\frac{mvr}{mv}\right]=[L]=\left[M^0LT^0\right].$

23. Dimension of resistance in an electric circuit in terms of dimensions of mass M, of length L, of time T and of current I, would be :

a) ML^2T^{-2} b) $ML^2T^{-1}I^{-1}$ **c)** $ML^2T^{-3}I^{-2}$ d) $ML^2T^3I^{-1}$

Solution : -

Resistance, R = $\frac{V}{I}$

But V = $\frac{work}{change}=\frac{work}{It}$

where, I = current, t = time

So R = $\frac{work}{I\times It}=\frac{work}{I^2t}$

Work = ML^2T^{-2}

Dimensions of R = $\frac{\left[ML^2T^{-2}\right]}{\left(I^2T\right)}$

[R] = $ML^2T^{-3}I^{-2}$

24. The physical quantity having the dimensions [$M^{-1}L^{-3}T^3A^2$] is:

a) resistance b) resistivity **c) electrical conductivity** d) electromotive force

Solution : -

Resistivity, $\rho=\frac{m}{ne^2\tau}$

$\because[\rho]=\frac{[M]}{\left[L^{-3}\right][AT]^2[T]}=\left[ML^3A^{-2}T^{-3}\right].$

So, electrical conductivity,

$\sigma=\frac{1}{\rho}$ or $[\sigma]=\frac{1}{[\rho]}=\left[M^{-1}L^{-3}A^2T^3\right].$

25. The length of a simple pendulum is about 100 cm known to an accuracy of I mm. Its period of oscillation is 2 s determined by measuring the time for 100 oscillations using a clock of 0.1 s resolution. What is the accuracy in the determined value of g?

a) 0.2% b) 0.5% c) 0.1% d) 2%

26. Assertion: When percentage errors in the measurement of mass and velocity are 1% and 2% respectively, the percentage error in K.E. is 5%.

Reason: $\frac{\triangle K}{K} = \frac{\triangle m}{m} + \frac{2\triangle v}{v}$

a) If both assertion and reason are true and reason is the correct explanation of assertion.

b) If both assertion and reason are true but reason is not the correct explanation of assertion.

c) If assertion is true but reason is false. **d) If both assertion and reason are false.**

27. When a man is standing, rain drops appear to him falling at 60° from the horizontal from his front side. When he is travelling at 5 km per hour on a horizontal road they appear to him falling at 30°, from the horizontal from his front side. The actual speed of the rain is (in km per hour):

a) 3 b) 4 **c) 5** d) 6

28. Assertion: A dimensionally wrong or inconsistent equation must be wrong.

Reason: A dimensionally consistent equation is an exact or a correct equation.

a) If both assertion and reason are false

b) If both assertion and reason are true and reason is the correct explanation of assertion.

c) If both assertion and reason are true but reason is not the correct explanation of assertion

d) If assertion is true but reason is false.

Solution : -

A dimensionally consistent equation need not be actually an exact or correct equation, but a dimensionally wrong or inconsistent equation must be wrong

29. The respective number of significant figures for the numbers 6.320, 6.032, 0.0006032 are

a) 3,4,8 b) 4,4,8 **c) 4,4,4** d) 4,3,4

Solution : -

According to the rules of significant figures 6.320 has four significant figures.

30. Which of the following pairs of physical quantities have same dimensions?

a) Force and power **b) Torque and energy** c) Torque and powder d) Force and torque

31. The range of masses we study in Physics is

a) 10^{-27} kg to 10^{60} kg b) 10^{-27} kg to 10^{55} kg **c) 10^{-30} kg to 10^{55} kg** d) 10^{-30} kg to 10^{60} kg

Solution : -

The range of masses goes from 10^{-30} kg (mass of an electron) to 10^{55} kg (mass of known observable universe).

32. The dimensions of the quantity $\vec{E} \times \vec{B}$, where $\vec{E}$ represents the electric field and $\vec{B}$ the magnetic field may be given as :

a) $[MT^{-3}]$ **b) $[M^2LT^{-5}A^{-2}]$** c) $[M^2LT^{-3}A^{-1}]$ d) $[MLT^{-2}A^{-2}]$

33. What is the value of a light year in terms of astronomical units?

a) 6.32×10^4 A.U. b) 5×10^2 A.U. c) 7×10^5 A.U. d) 5×10^6 A.U.

Solution : -

We know that, I light year (1 ly) = 9.46×10^{15}m

and I astronomical unit (1 A.U.) = 1.496×10^{11}m

$$\therefore \ \frac{1\ ly}{1\ A.U} = \frac{9.46 \times 10^{15} m}{1.496 \times 10^{11} m} = 6.32 \times 10^4$$

$$\therefore \ 1\ ly = 6.32 \times 10^4 \quad A.U.$$

34. The energy (E), angular momentum (L) and universal gravitational constant (G) are chosen as fundamental quantities. The dimensions of universal gravitational constant in the dimensional formula of Planck's constant (h) is:

a) zero b) -1 c) $\frac{5}{3}$ d) 1

Solution : -

$h \propto G^x L^y E^z$

$[M^1L^2T^{-1}] \propto [M^{-1}L^3T^{-2}]^x[M^1L^2T^{-1}]^y[M^1L^2T^{-2}]^z$

$[M^1L^2T^{-1}] = k\ [M^{-1}L^3T^{-2}]^x[M^1L^2T^{-1}]^y[M^1L^2T^{-2}]^z$

Comparing the powers, we get;

1=-x+y+z .... (i)

2 = 3x + 2y+ 2z .... (ii)

-1=-2x-y-2z .... (iii)

On solving eqns. (i), (ii) and (iii), we get; x = 0.

35. A spherometer has a least count of 0.005 mm and its head scale is divided into 200 equal divisions. The distance between consecutive threads on the spherometer screw is:

a) 0.005 mm **b) 1.0 mm** c) 1.0 cm d) 0.0025 mm

Solution : -

$Least\ count = \frac{pitch}{number\ of\ divisions}$

$\therefore\ pitch = least\ count\ \times\ number\ of\ divisions$

= 0.005 x 200 = 1 mm.

36. Generation, propagation and detection of electromagnetic waves is the basis of

a) lasers b) reactors **c) radio and television** d) computer

Solution : -

Generation, propagation and detection of electromagnetic waves is the basis of radio and television.

37. Unit of dipole moment is:

a) Amp-mt **b) Cb-mt** c) Amp-mt^2 d) Cb-mt^2

38. The length and breadth of a metal sheet are 3.124 m and 3.002 m respectively. The area of this sheet up to four correct significant figures is: (in m^2)

a) 9.37 **b) 9.378** c) 9.3782 d) 9.378248

Solution : -

Given length (l) = 3.124 m and breadth (b) = 3.002 m. We know that area of the sheet (A) = l x b = 3.124 x 3.002 = 9.378248 m^2. Since, both length and breadth have four significant figures, therefore area of the sheet after rounding off to four significant figures is 9.378 m^2.

39. Which of the following relations for the displacement of a particle undergoing simple harmonic motion is not correct dimensionally?

a) $y = a\sin\frac{2\pi t}{T}$ b) $y = a\cos\omega t$ **c)** $y = \frac{a}{T}\sin\left(\frac{t}{a}\right)$ d) $y = a\sqrt{2}\left(\sin\frac{2\pi t}{T} + \cos\frac{2\pi t}{T}\right)$

Solution : -

Dimensions on RHS must be displacement [L]. Arguments of sine and cosine are dimensionless. Hence, option (c) is not correct.

40. Angular momentum has the same dimensions as:

a) Planck's constant b) Universal gravitational constant c) Rydberg constant d) Boltzmann constant

41. The dimensions of $(\mu_0\epsilon_0)^{\frac{-1}{2}}$ are ________

a) $\left[L^{1/2}\ T^{-1/2}\right]$ b) $\left[L^{-1}\ T\right]$ **c)** $\left[LT^{-1}\right]$ d) $\left[L^{-1/2}\ T^{1/2}\right]$

Solution : -

$c = \text{ velocity of light } = \frac{1}{\sqrt{\mu_0 \epsilon_0}}$ so dimensions are LT^{-1}

42. The unit of Planck's constant h is same as that of:

a) energy b) work c) linear momentum **d) angular momentum**

43. Which of the following has the dimension of pressure?

a) $\frac{ML}{T^2}$ b) $\frac{M}{(L^2T^2)}$ **c)** $\frac{M}{(LT^2)}$ d) $\frac{M}{(LT)}$

Solution : -

Now P = $\frac{F}{A}$

[P] = $[\frac{MLT^{-2}}{L^2}]$

So, [P] = $[\frac{M}{LT^2}]$

44. Two resistors of resistances R_1 = (300 ± 3) Ω and R_2 = (500 ± 4) Ω are connected in series. The equivalent resistance of the series combination is :

a) (800 ± 1) Ω **b) (800 ± 7) Ω** c) (200 ± 7) Ω d) (200 ± 1) Ω

Solution : -

The equivalent resistance of series combination is

$R_s = R_1 + R_2$ = 300 Ω + 500 Ω = 800 Ω

The error in equivalent resistance is given by

$\Delta R = (\Delta R_1 + \Delta R_2)$ = (3 + 4) Ω = 7 Ω

Hence, the equivalent resistance along with error is (800 ± 7) Ω

45. The values of two resistors are R_1= (6 ± 0.3)$k\Omega$ and R_2 = (10 ± 0.2)$k\Omega$. The percentage error in the equivalent resistance when they are connected in parallel is :

a) 5.125% b) 2% c) 3.125% d) 7% **e) 10.125%**

Solution : -

R_1= (6 ± 0.3)$k\Omega$ and R_2 = (10 ± 0.2)$k\Omega$, R_p=?

$$R_{parallel} = \frac{R_1R_2}{R_1+R_2} \quad [Let \quad (R_1+R_2)=X] \text{ or } \quad R_p = \frac{R_1R_2}{X}$$

$$\text{In } R_p = \ln R_1 + \ln R_2 - \ln X$$

$$\text{Differentiating, } \frac{\Delta R_p}{R_p} = \frac{\Delta R_1}{R_1} + \frac{\Delta R_2}{R_2} + \left(-\frac{\Delta X}{X}\right)$$

In addition or subtraction, errors are calculated as follows:

$$\Delta X \text{ is mean } (\Delta R_1 + \Delta R_2) = \Delta X_{mean} = \frac{0.3+0.2}{2} = 0.25\Omega$$

$$R_{mean} = \frac{6\Omega+10\Omega}{2} = 8\Omega$$

$$\therefore R_{mean} = \frac{6\Omega+10\Omega}{2} = 8\Omega$$

$$\frac{\Delta X}{X} = \frac{0.25}{8} = 0.03125$$

$$\therefore \text{ Total error } = \frac{0.3}{6} + \frac{0.2}{10} + \frac{0.25}{8}$$

= 0.05 + 0.02 + 0.03125 = 0.10125

$\therefore \quad \frac{\Delta R_p}{R_p} \approx$10%

46. If the dimensions of a physical quantity are given by $M^a L^b T^c$, then the physical quantity will be __________

a) Velocity if a = 1, b = 0, c = -l b) Acceleration if a =1, b = l, c = -2 c) Force if a = 0, b = -1, c = -2

d) Pressure if a = l, b = -1, c = -2

Solution : -

$$\text{Pressure } = \frac{\mathrm{F}}{\mathrm{A}} = \frac{\mathrm{MLT}^{-2}}{\mathrm{L}^2} = \mathrm{ML}^{-1}\,\mathrm{T}^{-2}$$

$$\Rightarrow a = 1, b = -1, c = -2.$$

47. If the size of bacteria is 1 micron, what will be the number of it in 1 m length?

a) One hundred b) One crore c) One thousand **d) One million**

Solution : -

1 micron = 10^{-6} m

∵ 10^{-6} m space is occupied by 1 bacteria.

∴ 1 m space will be occupied by

10^6 bacteria = 1 million bacteria

48. The unit of force and length are doubled, the unit of energy will be:

a) $\frac{1}{4} times$ b) $\frac{1}{2} times$ c) 2 times **d) 4 times**

49. If $V = \sqrt{\frac{\gamma P}{\rho}}$, then dimensions of γ are:

a) [$M^0L^0T^0$] b) [$M^0L^0T^{-1}$] c) [$M^1L^0T^0$] d) [$M^0L^1T^0$]

Solution : -

$$V = \sqrt{\frac{\gamma P}{\rho}} \quad or \quad \gamma = \frac{V^2 \rho}{p}$$

$$[\gamma] = \frac{[LT^{-1}]^2 [ML^{-3}]}{[ML^{-1}T^{-2}]} = [M^0 L^0 T^0]$$

50. The displacement of a progressive wave is represented by $y = A\sin(\omega t - kx)$ where x is distance and t is time. Determine the dimensional formula of (i) ω and (ii) k.

a) [M^{-1}],[T^{-1}] **b) [T^{-1}] ,[L^{-1}]** c) [M],[T^{-1}] d) [M],[L]

Solution : -

Displacement of progressive wave $y = A\sin(\omega t - kx)$

As angle is dimensionless, there (ωt) as well as (kx) both must also be dimensionless

$$\therefore\ Dimension\ of\ \omega = Dimension\ of\ \frac{1}{t} = \frac{1}{[T]} = [T^{-1}]$$

$$Dimension\ of\ k = Dimension\ of\ \frac{1}{x} = \frac{1}{[L]} = [L^{-1}]$$

So, option (b) is correct.